

**International Journal of Biological and Agricultural Research****( IJBAR )**Journal home page: [www http://www.univ-eloued.dz/ijbar/](http://www.univ-eloued.dz/ijbar/)**Epidermal anatomic characterization of spontaneous plants belonging to Poaceae, Cistaceae and Boraginaceae families in Algerian northern sahara**

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**Abstract**

Microscopic examination of the epidermis of wild plants contained in the feces of the dromedary and ruminants is one of the methods for studying the animal diet. This work is a step to elaborate a reference catalog of epidermis to determinate the diet of camel and ruminants in the Saharan rang land situated in Algerian northern Sahara. In this paper, we described the most important epidermal anatomical characteristics of spontaneous perennial plants and ephemeral (08 species and 03 families) grazed on Saharan rang land, by using an binocular light microscope. From the results, we propose an identification key to these 08 species from their epidermal characters.

**Key words:** Animal diet, Camel, Epidermis, anatomy examination, Sahara, Spontaneous plants.

**Introduction**

The Sahara is characterized by its extreme aridity. It is an ecoregion, in which the desert conditions reach their greatest bitterness [1] and [2]. The northern Algerian Sahara has different geomorphologic zones or types of rangeland (rivers, depressions, hamada, sandy soils, regs and salty soils) which offer the only food resource available for the dromedary [3].

The Saharan plants present different ecological and environmental, they represent a source of food and refuge for many living beings [4]. They represent a particular interest for the Camel which remains the only species of breeding able to valorize these plants in the most rational way [5].

The study of the Camel diet and ruminants can be carried by several methods. The most common are animal observation in pastures and microscopic analysis of plant debris collected at different levels of the digestive tract or feces [6]. Microscopic analysis of plant debris is based on the observation of the anatomical characteristics of their epidermal cells. The constitution of a reference catalog shows the epidemic characteristics of plants. To make this catalog, it is necessary to study fragments of epidermis for different parts of plant (leaves, stem ...).

## 1. Materials and Methods

It's difficult to establish standard epidermis identification characteristics. However, depending on the environment where the animal species is studied, the researcher establishes reference collection and the epidermis are identified according to a set of criteria easily observable under the microscope [7].

The main criteria that we adopted in our analysis are essentially based on [8]:

- Epidermal cells organization and forms;
- Veins leave orientation;
- Stomata and Trichoms types.

The epidermal characters not all having the same importance; we have studied, particularly, the epidermal cells type (form, position and their arrangement), stomata and Trichoms type (hairs).

Plant specimens were collected from tree different localities of Saharan Rangelands (table01).

Table 01: Specimens used for anatomical studies, their families and common name.

Families	Plant species	Common name
Boraginaceae	<i>Arnebia decumbens</i>	Homeir
	<i>Moltkia ciliata</i>	Elhelma
	<i>Echium pycnanthum</i>	Hemimiche
Cistaceae	<i>Helianthemum lippii</i>	Semhri
Poaceae	<i>Aristida pungens</i>	Drin
	<i>Aristida acutiflora</i>	Sefar
	<i>Pharagmitescomminus</i>	Berbita
	<i>Polypogonmonspeliensis</i>	DilElfar

### 1.1 Techniques adopted

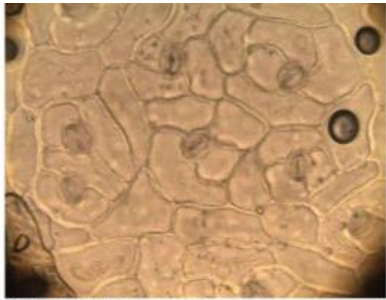
In this work we have adopted on fresh specimens [9]. The anatomical studies were carried out on fresh specimens. We affected longitudinal sections of leaves were treated theme by chloral hydrate to removed chlorophyll; the sections were rinsed with water.

### 1.2. Observations and measurements

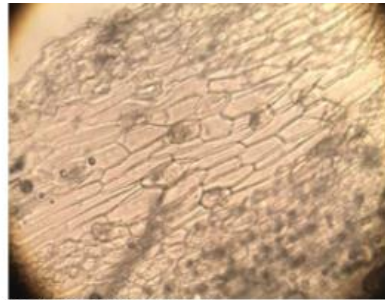
The measurements and photographs were taken using "Motic image plus 2" binocular light microscopes. The epidermal fragments obtained are placed in a drop of water between the slide coverslip and then observed under a light microscope. The best fragments are photographed to constitute a catalog of reference of epidermis.

## 2. Results and Discussion

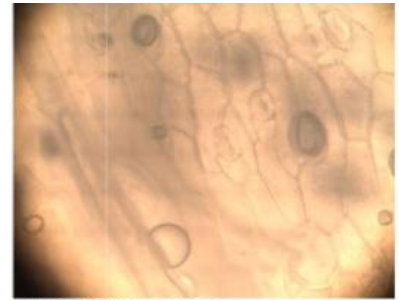
The histological study of the epidermal cells of the studied species shows intra and inter family differences in the fundamental morphological characteristics. We have, elaborated a list of 15 photos for 08 species belonging to 03 families (photos from 01 to 15).



**Photo 1.** Epidermis of *Moltkia ciliata* (leaf)



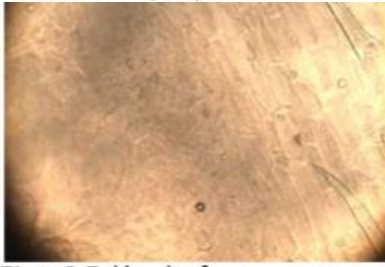
**Photo 2.** Epidermis of *Moltkia ciliata* (stem)



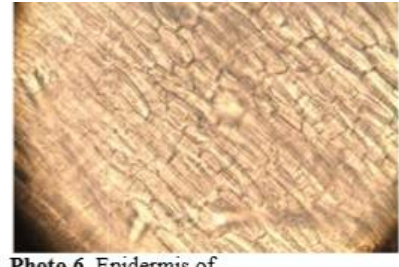
**Photo 3.** Epidermis of *Arnebia decumbens* (leaf)



**Photo 4.** Epidermis of *Arnebia decumbens* (stem)



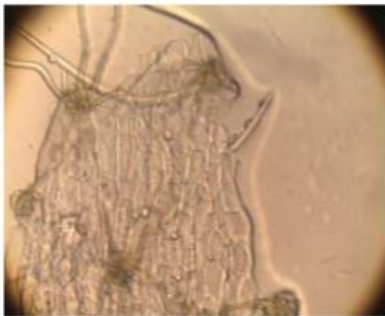
**Photo 5.** Epidermis of *Echium pycnanthum* (leaf)



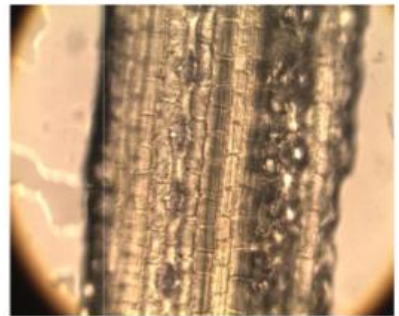
**Photo 6.** Epidermis of *Echium pycnanthum* (stem)



**Photo 7.** Epidermis of *Helianthemum linnii* (leaf)



**Photo 8.** Epidermis of *Helianthemum linnii* (stem)



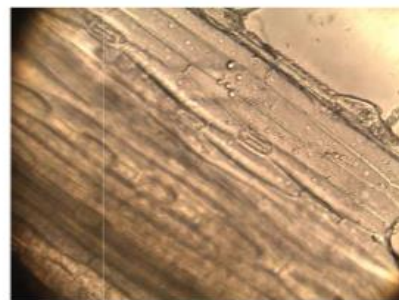
**Photo 9.** Epidermis of *Phragmites communis* (leaf)



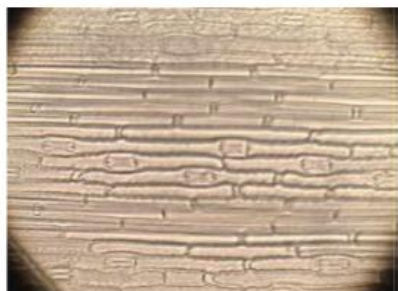
**Photo 10.** Epidermis of *Phragmites communis* (stem)



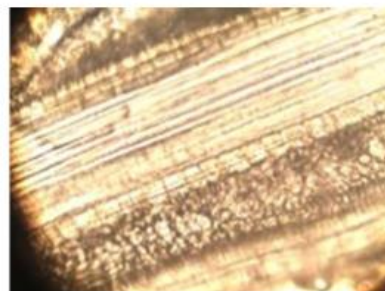
**Photo 11.** Epidermis of *Aristida vulmosa* (leaf)



**Photo 12.** Epidermis of *Polydognonmon speliensis* (leaf)



**Photo 13.** Epidermis of *Polydognonmon speliensis* (stem)



**Photo 14.** Epidermis of *Aristida acutiflora* (leaf)



**Photo 15.** Epidermis of *Aristida acutiflora* (stem)

## 2.1. Epidermal cells

The longitudinal sections of leaves show that the epidermal cells vary from family to another and in the same species in leaf and stem. The principal characteristics can be recap as follows:

The epidermal cells of:

- Poaceae are generally elongated and arranged in rows parallel to confirm the work of MANDRET [6].
- Family of Asteraceae, the cells are arranged in puzzle in the leaves and in the stems, they are in elongated form (Photos, 6 and 7);
- Boraginaceae, in leaf of *Moltkia ciliata* and *Arnebia decumbens* (Photos 1, 2, 3, 4), have the same forms of epidermal cells (polygonal and rectangular), which is confirmed by the work of [10] for the first species, however at the stems in *Moltkia ciliata* there are two forms of epidermal cells (polygonal and rectangular). It is the same results found by [10], and the epidermal cell of *Arnebia decumbens* has two forms (rectangular and rounded) which are confirmed by [11].
- Cistaceae The leaf anatomy section for *Helia themumlipii*, (Photos 7 and 8) illustrate polygonal epidermal cells, it is the same results found by [12], with smooth hair in star tuft, [6] and [13], in the stem of this family, in the *Heliathemumlipii* we have noted that the epidermal cells have two forms polygonal and rectangular results quite similar as [12]
- For Poaceae family, the species *Aristida pulmosa*, *Aristida acutiflora* and *Phragmites communis* the longitudinal section of epidermal cells shown the same form (rectangular and square) the same results found by [14] and [15].
- *Polypogonmon speliensis* present elongate cells it is the same results found by [10], but in the stem of *Polypogonmon speliensis* the epidermal cells has rectangular form, which is confirmed by the work of [14].

## 2.2. Stomata

The anatomical study of the epidermis in *Moltkia ciliata*; *Arnebia decumbens* and *Echium pycnanthum* belong to the family Boraginaceae (Photos 1, 2, 3, 4, 5, 6); it has been noticed that the three species have the same type of stomata (anomocytic), which is confirmed by the work of [11].

The stomata density and stomatal length are respectively for each species *Moltkia ciliata* (4 stomata / mm<sup>2</sup>, 110.4 μm), *Arnebia decumbens* (6 stomata / mm<sup>2</sup>, 82.6 μm), and *Echium pycnanthum* (7 stomata / mm<sup>2</sup>, 58.32 μm).

For the family of Cistaceae in the species *Heliathemum lipii* the stomata type was (anomocytic), the same results obtained by [12], and the stomata density is 5 stomata / mm<sup>2</sup> with a length 78.5 μm.

In *Phragmites communis*, *Aristida plumosa* and *Polypogonmon speliensis* (Poaceae family), we have noted that the type of leaf stomata was (paracytic), the same result obtained by [16].

In *Phragmites communis* the stomata density 4 stomata / mm<sup>2</sup> with a length 84.45 μm, and *Aristida plumosa* the stomata density is (5 stomata / mm<sup>2</sup>) with a length (104 μm), and at *Polypogonmon speliensis* the calculated stomata density is 3 stomata / mm<sup>2</sup> with a length (111.86 μm). And *Aristida acutiflora* the histological section show that there aren't stomata in their leaf epidermis.

## Trichoms (Hairs)

One of the adaptive characteristics of Saharan spontaneous plants is the presence of hairs [17], [18] to minimize evapo-transpiration to save water. For the specimens studied, some epidermis presents unicellular hairs with different long.

The Boraginaceae family (*Echium pycnanthum*); the species has unicellular hairs on leaves and stems (Photos 5 and 6).

For the Cistaceae family (*Limoniastrum guyonianum*) has smooth tufted hairs (Photos 7 and 8);

For poaceae family, the species, *Aristida pulmosa* (Photo 11) is the only species in this family that has unicellular hairs in the leaves. The other species are devoid of hairs.

## Conclusion

The microscopic analysis of the epidermis of the spontaneous plants of the three botanical families (Poaceae, Cistaceae and Boraginaceae) in the leaves and stems shows that:

- The epidermal characteristics vary from family to another and from species to another and in the same species between the two parts (leaf and stems). For the family Poaceae the species, present the forms (rectangular, cubic in the leaf and rectangular, puzzle in the stems), for the family Cistaceae the form of the epidermal cells, (polygonal and rectangular), and the family Boraginaceae the forms of epidermal cells (polygonal, rectangular, rounded).

- The stomata types always remains constant in all species of the family Boraginaceae (anomocytic and paracytic), in the family Cistaceae we find the type anomocytic, as well as in the family of Poaceae the type of stomata remains constant (paracytic).

- For the hairs species *Echium pycnanthum* has unicellular hairs at the leaf and stems; *Limoniastrum guyonianum* has smooth, star-tufted hairs, and in the end, *Aristida pulmosa* has unicellular hairs in the leaves. Other species have no hair.

The analysis of some epidermal characteristics makes it possible to differentiate between species when the study concerns a zone that is not very extensive, unlike endemic species that may have different epidermal characteristics from one zone to another. This method allows us to have the basic data to study variations in the spatio-temporal diet of the dromedary and even other animals.

## References

[1]. Toutain G., 1979. Elément d'agronomie Saharienne de la recherche au développement Ed. I.N.R.A. Paris, 296 Pages.

[2]. Ozenda P., 1983. Flore du Sahara. Ed. Centre nati. rech. sci. (C.N.R.S.), Paris, 622 Pages.

[3]. Chehma A., 2005. Etude floristique et nutritive des parcours camelins du Sahara septentrionale Algérienne cas de la région de Ouargla et Ghardaïa, Thèse de Doctorat Univ. Annaba ; 178 Pages.

[4]. Houari K.D., 2006. Impacte de la nature des sols Saharienne sur la composition chimique de quelques plantes de la région d'Ouargla. Mémoire Maj. Univ. Ouargla ; 89 Pages.

[5]. Chehma A., Faye B., Bastianelli D., 2010. Valeurs nutritionnelles de plantes vivaces des parcours sahariens algériens pour dromadaires. *Fourrages* (2010) 204, 263-268.

- [6] Mandret, 1989. Le régime alimentaire des ruminants domestiques (bovins-ovins-caprins) sur les pâturages naturels sahéliens et soudano-sahéliens. *Revue Sénégalaise des Recherches Agricoles et Halieutiques*; 2:79 -88.
- [7] Butet A., 1987. L'analyse microscopique des fèces: une technique non perturbant d'étude des régimes alimentaire des mammifères phytophages. *ARVICOLA* ; IV : 33-38
- [8] Butet A., 1985. Méthodes d'étude du régime alimentaire d'un rongeur polyphage (*Apodemus sylvaticus* L., 1758) par l'analyse microscopique des fèces. *J. Mammalia* 49: 461- 462.
- [9] Martin, D. J. 1955. Features of plant cuticle. An aid to the analysis of the natural diet of grazing animals, with special reference to Scottish Hill Sheep. *Trans. Bot. Soc. Edimb.*; 36 : 278-288.
- [9] Metcalfe, C.R. & Chalk. 1957. *Anatomy of the dicotyledones*. Clarendonpress, Oxford.
- [10] Slimani N. Bouras S. et Chehema A., 2013. Caractérisation épidermique des principales plantes spontanées broutées par le dromadaire dans le Sahara septentrional algérien. *Revue des Bio Ressources*; 3 (1): 22-31
- [11] Tulay A., Senay U., and Adnan A. 2010. Morphological, anatomical and numerical studies on some *anemone* l. (*Boraginaceae*) taxa from TURKEY. *Pak. J. Bot.*; 42(4).
- [12] Belkhal A. et Belkhir A. 2016. Contribution à l'élaboration d'un catalogue de référence des principaux pâturages du Sahara septentrional algérien (Ouargla et Oued Souf), Mémoire de mastère univ. Ouargla.
- [13] Öznur Ergen A. and Rizabinzet (2010). Micromorphological studies on Nutlets of Some *Onosma* L. (*Boraginaceae*) Species from Turkey; *Pak. J. Bot.*, 43(2).
- [14] Bourasse S., 2010. Elaboration d'un catalogue de référence des épidermes des principales plantes spontanées broutées par le dromadaire au Sahara septentrional algérien (cas d'El oud, Ouargla et Ghardaïa), mémoire de fin d'étude ,université KASDI MERBAH .OUARGLA.
- [15] Ogie-Odia, E. A., Esegbe D., Illechi, M. N., Erhabor J., and Ogbebor, E. (2010). foliar epidermal and phytochemical studies of the grasses *Cymbopogon citratus* (STAPF.), *Axonopus compressus* (P. BEAUV.) and *Eragrostis stremula* (S. W. BEAUV) IN EKPOMA, EDO STATE, NIGERIA. *Science World Journal*; 5 (1).
- [16] HariBabu R. and Savithamma N. (2014). Screening of secondary metabolites of underutilized species of *Cyperaceae*. *IJPSRR*; 24(2): 182-187.
- [17] Slimani N. et Chehema A., 2009 : Essai de caractérisation de quelques paramètres d'adaptation au milieu hyper-aride saharien des principales plantes spontanées vivaces de la région d'Ouargla (Algérie). *Journal Algérien des régions arides*; 8: 15-20.
- [18] Slimani N., 2008: Essai de caractérisation de quelques propriétés d'adaptation au milieu saharien des principales plantes spontanées vivaces de la région d'Ouargla et Ghardaïa, Mémoire de magistère univ. Ouargla, 96 pages.

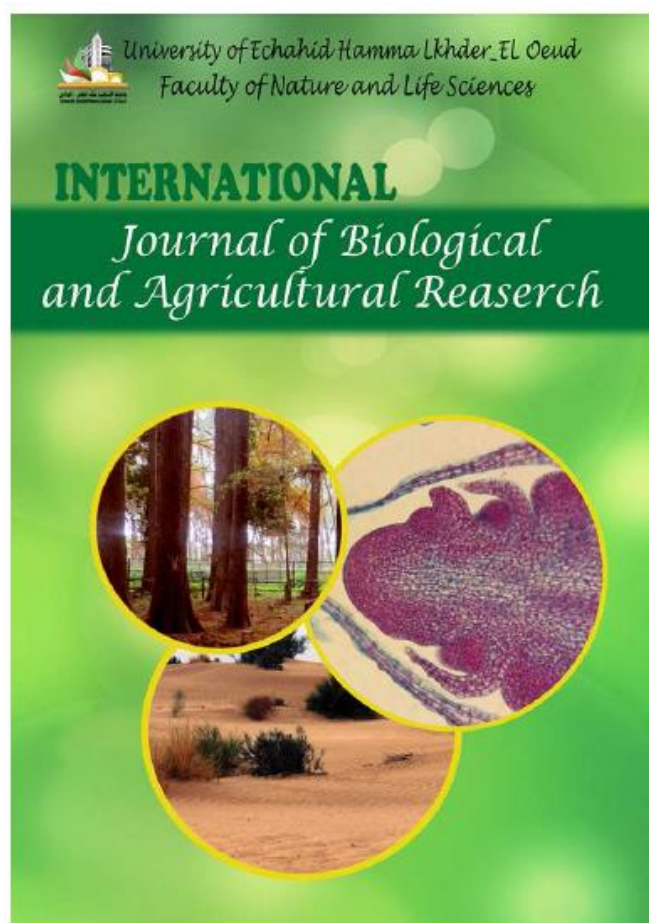
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